

ditions. It is surviving a second summer here (July, 1962), but like last year shows no sign of blooming after the spring season. The potential area which this species may occupy is evidently very great. It should be watched for as an escape elsewhere in the United States and southern Canada.

Mazus japonicus is an annual weed which, like several others, both alien and native (e.g. *Cardamine pennsylvanica*, *Stachys floridana*, *Youngia japonica*), is being spread all through the South in shipments of ornamental shrubs, especially azaleas and camellias. There are specimens in the SMU Herbarium from Alabama (Baldwin Co.), Arkansas (Clark Co.), Florida (Liberty Co.), Louisiana (Lafayette, Ouachita, and St. Tammany parishes; Pennell knew it from East Baton Rouge and Orleans parishes), and Texas (Dallas, Harrison, and Jefferson counties). The Dallas plants seem to have been killed out by the abnormally severe winter of 1961-1962, with repeated severe freezes (down to 17° F.), but further observation will be needed to confirm this. — LLOYD H. SHINNERS, SOUTHERN METHODIST UNIVERSITY, DALLAS 22, TEXAS.

STUDIES IN THE GUTTIFERAE. II.
TAXONOMIC AND DISTRIBUTIONAL
OBSERVATIONS ON NORTH AMERICAN TAXA¹

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This contribution is a miscellany of observations which have accumulated during recent studies of the *Guttiferae* in North America. Included are comments on the delimitation of the *Guttiferae*, a re-evaluation of the generic status of *Sanidophyllum* Small, the relegation to synonymy of a few specific epithets, some notes on geographic distribution of

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several species, and a brief survey of some of the systematic problems discernible in the family.

DELIMITATION OF THE GUTTIFERAE

The Englerian concept of the *Guttiferae* as comprising five subfamilies is being followed in my studies. Some recent authors, including Lawrence (1951) and Hutchinson (1959), have split the group into two families, elevating Engler's *Hypericoideae* to the familial level (*Hypericaceae*). This restricted concept was used by me in earlier studies (Adams, 1957, 1959). Recent investigation of the relevant genera by Dr. Norman K. B. Robson at Kew strongly suggests that a re-evaluation of the claim of the *Hypericaceae* to family rank is necessary (Robson, personal communication). I agree with Dr. Robson that if Engler's *Hypericoideae* is elevated to the family level then it would appear that the other four subfamilies must be made into families also. This is clearly undesirable because of the close interrelationship which these groups appear to have with one another. The *Hypericoideae* seem to be related to the *Calophylloideae* and to the *Clusioideae* through *Hypericum* (Lawrence, 1951; Robson, personal communication). The other members of the *Hypericoideae* are *Triadenum* (eastern North America and Japan), *Vismia* (tropical America), *Cratoxylon* (Indomalaysia), *Eliaea*, *Psorospermum*, *Endodesmia*, and *Haronga*. (The last three genera are native to tropical Africa and/or Madagascar.) One of Small's generic segregates, *Sanidophyllum*, of southern Florida, U. S. A., is best included within *Hypericum* (see below).

RE-EVALUATION OF THE GENERIC STATUS OF SANIDOPHYLLUM

The genus *Sanidophyllum* was established by Small in 1924 to accommodate a single species, *S. cumulicola* Small. Plants of this taxon are wiry herbaceous perennials which grow in the *Pinus clausa* scrub in Highlands Co., Florida. Commonly, several stems arise from an elongated taproot near or just below ground level. The stems die back to ground level each winter but the rootstocks survive for several years. New growth each spring is due to the forma-

tion of young shoots from these rootstocks. On the juvenile stems the leaves are densely crowded and tend to be more or less closely appressed, the whole presenting a striking bryoid appearance. As the stems elongate the internodes become much longer at successively higher levels. Much of the photosynthetic function is apparently carried on by the stems since the leaves are greatly reduced in size compared to other *Hypericum* species, excepting *H. gentianoides*. The slender, sharply ascending stems with their tiny scale-like leaves suggested to Small a species of *Cathartolinum* (*Linum*).

Recent intensive studies of the floral anatomy and taxonomy of *Hypericum* and several of the generic segregates (Robson, 1956; Adams, 1962) have demonstrated that a re-evaluation of the status of these groups is necessary. While the anatomy of the flower in *Sanidophyllum cumulicola* has not been investigated, comparative morphological study of these plants as well as their relatives in *Hypericum* Sect. *Brathys* strongly suggests that this species represents merely an extreme evolutionary development within this section of *Hypericum*. Morphological features common to *Sanidophyllum* and certain species of *Hypericum* (especially many of those in Sect. *Brathys*) include perennial habit, much-reduced scale-like leaves which lack an articulation at the base, clear glands in the leaves, sepals, and young stems, 5 slightly unequal sepals which are non-articulated at base, 5 slightly asymmetrical yellow petals whose withered remains persist long after anthesis, long-persistent stamens, 3 filiform-elongate styles which are separate to the base and somewhat spreading at anthesis, capitate stigmas, 3-carpelled gynoecium, parietal placentation, and dark brown seeds with a finely reticulate testa.

In its morphology as well as its ecology *Sanidophyllum cumulicola* seems to be most closely related to *H. gentianoides* (L.) BSP, a plant found over much of eastern United States. The leaves of both are considerably reduced in surface area, with those of the latter species being noticeably smaller than the former. Plants of both species possess slender wiry stems; those of *H. gentianoides* are often much-

branched, presenting a bushy appearance in contrast to the relatively few-branched aspect of *S. cumulicola*. The widespread *H. gentianoides* is an annual, even in peninsular Florida, while the very local *S. cumulicola* is definitely perennial. The inflorescence in both species is basically dichasial, the pattern typical of *Hypericum*. The flowers of *H. gentianoides* are considerably smaller in size than those of *S. cumulicola*. All these features suggest a fairly close relationship.

Both of these plants are adapted to dry habitats. *Sanidophyllum cumulicola* grows in the sand of the scrub in association with *Pinus clausa*, *Paronychia pulvinata*, *Polygonella basiramia*, *Prunus geniculata*, *Ceratiola ericoides*, and other species. It is most abundant in "blow-out" areas where the moisture is more abundant and the competition from other sand scrub species is less severe. *Hypericum gentianoides* also grows in sandy soil, often becoming very abundant in turkey oak-pine scrub (especially following clearing by man), fallow fields, moist hollows in coastal dunes, rock outcrops, and roadside embankments. Both of these species are closely related to *H. drummondii* (Grev. & Hook.) T. & G., a plant of the southern United States.

Sanidophyllum cumulicola is related, although much less closely, to *Hypericum fuertesii* Urb. of Hispaniola. Plants of this West Indian species have much-reduced leaves which are strongly ascending and crowded. The inflorescence of *H. fuertesii* is much less floriferous, however, and is often reduced to a 3-flowered dichasium or even a single flower. It is an inhabitant of high elevations (6,000-8,000 feet) while *S. cumulicola* grows at only a few hundred feet. Other relatives of this species comprise the *H. pauciflorum* complex in Mexico and Central America (see below).

The reduction of *Sanidophyllum* to *Hypericum* makes necessary the following combination:

***Hypericum* (Sect. *Brathys*) *cumulicola* (Small) P. Adams, *comb. nov.*, based on *Sanidophyllum cumulicola* Small, Bull. Torrey Club 51:391. 1924.**

The limited distributional area of this species is being diminished at an alarming rate. The sand scrub lands of central and southern Highlands County, Florida, are rapidly

succumbing to the bulldozer and the citrus grove. Studies of the ecology and cytology need to be made before the species becomes extinct.

TAXONOMIC NOTES

Hypericum aphyllum Lundell, Am. Midl. Nat. 29:477. 1943. TYPE: British Honduras, Toledo District, Monkey River, near Jenkins Creek, *Gentle 4175* (Holotype, MICH, not seen; isotype, GH).

Lundell distinguished this species from *Hypericum gentianoides* (L.) BSP, a plant of eastern United States, primarily on seed characters. The seeds of *H. aphyllum* were said to be shorter and the testa smoother than in *H. gentianoides*. Also, the number of seeds per capsule is twice that of *H. gentianoides*, according to Lundell. Two specimens from Florida were assigned to the new species also. My examination of many collections of *H. gentianoides* from throughout its range indicates that seed characteristics are highly variable. There is a tendency for the seeds to be shorter and the testa smoother in specimens from the southern portion of the range, with those of some collections (e.g. those cited by Lundell and others) much resembling those of *H. aphyllum*. Study of an isotype of that species strongly suggests that, upon consideration of the entire morphology of the plant, the claim of *H. aphyllum* to specific status is highly questionable. Dr. A. J. Sharp wrote upon the isotype sheet in 1950 that *H. aphyllum* is "doubtfully distinct" from *H. gentianoides*. I think that a thorough analysis of seed variation within the latter species ought to be made before recognizing the British Honduran plant as a separate taxon.

Hypericum pringlei Watson, Proc. Am. Acad. 25:143. 1890. TYPE: Mexico, Nuevo Leon, Sierra Madre, near Monterey, *Pringle 3012* (GH).

The type specimen of *H. pringlei* compares readily with numerous specimens of *H. perforatum* L. from western United States as well as from other regions. In my opinion Watson's species is conspecific with *H. perforatum*.

Hypericum terrae-firmae Sprague & Riley, Kew Bull. page

12. 1924. TYPE: British Honduras, *Peck 321* (Holotype, K, not seen; isotype, GH).

Sprague and Riley noted that their *Hypericum terrae-firmae* is "the representative on the mainland of the Cuban *H. styphelioides* A. Rich." However, they made no mention of the features which they used to separate the mainland plant. An isotype of *H. terrae-firmae* is hardly distinguishable, if at all, from many Cuban specimens of *H. styphelioides*, a species originally described in 1845 (Ess. Fl. Cuba. 237). Although the Cuban plants exhibit considerable variation, especially in leaf size and shape, I am unable to find any basis for taxonomic segregation of the Honduran specimens. I first questioned the claim of *H. terrae-firmae* to recognition in 1959 while doing casual study of the West Indian-Central American specimens of the genus at the Gray Herbarium. Recently, Dr. Louis O. Williams has independently arrived at the same conclusion, judging from his annotation of the isotype at the Gray Herbarium. It seems clear, therefore, that the plant of British Honduras can be readily assigned to the earlier-named *H. styphelioides*.

NOTES ON GEOGRAPHIC DISTRIBUTION

Since the publication of distribution maps for the species in the generic segregate *Ascyrum* (Adams, 1957) some noteworthy range extensions or corrections have come to my attention. These species were transferred to *Hypericum* by Adams and Robson (1961).

HYPERICUM STRAGULUM Adams & Robson (*Ascyrum multicaule* Michx.). Mr. W. E. Buker, an associate of the Carnegie Museum in Pittsburg, Pennsylvania, has written me that plants of this species have been collected in several counties of southwestern Pennsylvania. These collections (not seen by me) include the following: Bedford Co., south of Silver Mills, *Henry & Buker* 5/19/51; Fayette Co., Ohiopyle, *Shafer* 9/1/01, and *Bright* 9/6/1915; Greene Co., 1.5 miles east of Mt. Morris, *Beer, Henry & Buker* 8/8/51. All of these specimens are in the Herbarium of the Carnegie Museum, according to Mr. Buker.

At the time I published the revision of *Ascyrum* men-

tioned above, *Hypericum stragulum* was not known to grow in South Carolina. In September of 1958 I collected it five miles northwest of Walhalla in Oconee County (Adams 160, FSU). Diligent search in adjacent counties will do doubt reveal other stations.

HYPERICUM HYPERICOIDES (L.) Crantz (*Ascyrum hypericoides* L.). The disjunction in range which was thought to exist (Adams, 1957) in Mexico between southern Nuevo León and eastern Hidalgo, a distance of some 300 km, has been virtually eliminated by two recent collections. A station in the state of San Luis Potosí, about 50 miles east of the city of that name, was reported by Rzedowski & Rzedowski (1957). Plants of this species have been collected also in the state of Tamaulipas about 40 miles north-northwest of Aldama (the Sierra de Tamaulipas range) by Dr. R. L. Dressler (2408, GH).

SPECIES COMPLEXES REQUIRING INTENSIVE STUDY

During recent studies of North American *Hypericum* I have become aware of several taxa which are in need of critical evaluation. I believe that a brief discussion of these groups will be of interest, especially to the workers currently engaged in floristic studies. This is presented with the hope that other botanists, especially graduate students in search of thesis problems, will be enticed to study these plants. In addition, the naming of new taxa, especially in Mexico, is discouraged until thorough knowledge of the variation present within these groups is forthcoming.

The HYPERICUM PAUCIFLORUM complex

The Mexican-Central American members of *Hypericum* Sect. *Brathys* comprise a most variable group, judging from study of the specimens at the Gray Herbarium, the U. S. National Herbarium, and the Herbarium of the University of Texas. At least seventeen species have been described but several of these appear to represent only ecotypic variation. The great altitudinal diversity (from sea level to at least 12,000 feet) present in Mexico and Central America is most certainly correlated with much of the observable variability.

The taxa which belong to the so-called *H. pauciflorum* complex include the following: *H. brevistylum* Choisy, *H. denticulatum* HBK, *H. eastwoodianum* Johnston, *H. fastigiatum* HBK, *H. gnidioides* Seem., *H. hintonii* Bullock, *H. hondurasense* Keller, *H. longibracteatum* Keller, *H. paniculatum* HBK, *H. pauciflorum* HBK, *H. paucifolium* S. Wats., *H. pinetorum* Standley, *H. pratense* Cham. & Schl., *H. schaffneri* S. Wats., *H. silenoides* Juss., *H. submontanum* Rose, *H. uliginosum* HBK, and *H. woodsonii* Standley. These plants are related to the United States species *H. cumulicola* (Small) P. Adams, *H. denticulatum* Walt., *H. drummondii* (Grev. & Hook.) T. & G., and *H. gentianoides* (L.) BSP. Finally, the very distinctive *H. setosum* L., a plant of the United States Atlantic and Gulf Coastal Plain, is clearly a member of this complex also. Its pilose stems and leaves and ciliate sepals, not present in any other *Hypericum* in North America, are probably an independent evolutionary development.

Research in this complex should include field observations on growth form, perennation, altitudinal effects upon the plant body, and chromosome counts, as well as the usual examination of herbarium specimens. Pending the completion of at least a synoptic treatment of these taxa I would strongly advise against the publication of putative hitherto undescribed taxa. To continue to add to an obviously overburdened synonymy seems to be most unwise.

The HYPERICUM PUNCTATUM complex

Another group within *Hypericum* which is obviously in need of intensive study is the *H. punctatum* complex of Sect. *Hypericum*, as currently circumscribed (Keller, 1925). At least six species are recognized, including *H. formosum* HBK, *H. graveolens* Buckley, *H. mitchellianum* Rydberg, *H. pseudomaculatum* Bush, *H. punctatum* Lam., and *H. scouleri* Hook. These taxa are morphologically very similar and, therefore, presumably closely related. One of these, *H. formosum*, is a plant of high elevations from British Columbia southward through western United States and Mexico into Guatemala. The United States plants of this species are

classified either as a separate taxon, *H. scouleri* Hook., or as a variety. Many specimens of *H. formosum*, especially from Mexico and Guatemala, are practically identical with, if not indistinguishable from, those of *H. pseudomaculatum*, a plant of the Ozarkian region of Arkansas. Specimens of these two species compare readily with those of *H. graveolens*, a plant endemic in the Blue Ridge mountains of western North Carolina at high elevations. The Ozarkian *H. pseudomaculatum* has been considered to be a variety of *H. punctatum*, a plant widespread over much of eastern North America (Fernald, 1950). *Hypericum mitchellianum*, also endemic in the Blue Ridge mountains, is doubtfully distinct from *H. punctatum*. In fact, both possess an unusual ring formation of the chromosomes during meiosis (see below). Both *H. graveolens* and *H. mitchellianum* grow in close association at Mt. Mitchell, North Carolina.

At least two members of the *Hypericum punctatum* complex are highly interesting cytologically. During meiosis the sixteen diploid chromosomes become attached end-to-end, forming a ring. Such unusual behavior is often indicative of structural hybridity (Stebbins, 1950). This phenomenon was first reported by Hoar (1931) in Massachusetts plants. During my studies I have observed ring formation in plants of this species from North Carolina and Tennessee. I have also observed this abnormal cytological condition in several collections of *H. mitchellianum*. In the one collection of *H. pseudomaculatum* which I have been able to study (courtesy of Dr. Paul L. Redfearn) no evidence of meiotic irregularity was noted. This is taken to be further evidence supporting the specific distinctness of these plants from *H. punctatum*. No chromosome studies are available for *H. formosum*.

For the cytologically-inclined systematist the *Hypericum punctatum* complex presents a most intriguing problem. Several questions arise. For instance: Is the ring formation found in plants of *H. punctatum* throughout its geographic range? Is this condition actually absent in *H. pseudomaculatum*? Would intensive study reveal its presence in *H. graveolens* and *H. formosum*? What is the relationship between "true" *H. formosum* and the western United States *H.*

scouleri? Would careful study show that perhaps the Ozarkian *H. pseudomaculatum* is really conspecific with the Mexican *H. formosum*? What is the relationship, if any, between *H. punctatum* (a ring-forming plant) and these three taxa? Is the endemic *H. mitchellianum* worthy of taxonomic recognition and, if so, what is its relationship to *H. punctatum*? Could it be merely a high altitude ecotype of *H. punctatum*? These are merely a few of the more obvious questions which come to mind; doubtless many other problems exist within the *H. punctatum* complex.

The HYPERICUM CANADENSE complex

This highly polymorphic group within Sect. *Brathys* of eastern North America has long been a puzzle to botanists. The species limits are not at all clear. At least five are generally recognized, including *H. boreale* (Britt.) Bickn., *H. canadense* L., *H. gymnanthum* Engelm. and Gray, *H. majus* (Gray) Britt., and *H. mutilum* L. The taxonomic difficulties may well be due to extensive hybridization, as suggested by Fernald (1950). The principal taxonomic characters (at least those currently in use) are in the vegetative body, especially the leaves. Since these plants frequently grow on soils of varying wetness it is not at all unlikely that the habitat may affect the commonly-used characteristics. I have observed one species, *H. mutilum*, at many stations in northern Florida and southern Georgia and have noticed great variation in size and habit of the plants and in the size of the leaves. The presence of vegetative reproduction is an additional complicating factor, rendering the collection of population samples most difficult.

Numerous problems are suggested by even a cursory examination of the herbarium material and the literature. For example: Does hybridization actually occur? If so, is *H. dissimulatum* Bickn., as suggested by Fernald (1950), really "an unusually constant and recurrent hybrid" of *H. boreale* or *H. mutilum* and *H. canadense*? What is the status of Fernald's three varieties of *H. mutilum*? I can detect little, if any, geographic localization of any of them, excepting perhaps var. *latisepalum* which seems to be restricted

to the Atlantic and Gulf Coastal Plain. What is the status of Fernald's varieties *magninsulare* and *galiiforme* of *H. canadense*? Both appear to me to be merely responses to unusual habitat situations and perhaps not worthy of taxonomic recognition.

The HYPERICUM DENTICULATUM complex

An interesting problem involving variation within *Hypericum denticulatum* Walt. is discernible. According to Fernald and Schubert (1948) this species of the eastern United States comprises three varieties, each with some degree of geographic localization. One of these, var. *denticulatum*, grows on the Atlantic Coastal Plain from New Jersey southward to at least South Carolina. Fernald and Schubert's map also shows a station on the Cumberland Plateau in central Tennessee, a disjunction of at least three hundred miles from the nearest South Carolina locality. A second variety, *recognitum*, is principally a plant of the upland and mountainous areas from southeastern Virginia, through the inner Piedmont of North Carolina to northeastern Alabama and northward into southern Indiana and West Virginia. Fernald and Schubert's map shows an occasional station near the Fall Line in South Carolina, Georgia, and Alabama. The third variety, *acutifolium*, is scattered about the southeastern United States, with occasional stations on the outer Piedmont of Virginia and North Carolina, the Coastal Plain of South Carolina and adjacent southeastern North Carolina, northern Florida, the outer Piedmont of Georgia and adjacent Alabama, and the Cumberland Plateau of Tennessee.

Leaf shape was the principal feature used by Fernald and Schubert (1948) to distinguish these three varieties. In one, var. *acutifolium*, all or at least the middle and upper leaves were described as "narrowly linear or linear-lanceolate" while in a second, var. *denticulatum*, the leaves were "narrowly to broadly ovate, oval or oboval." These two extremes in leaf shape can be recognized fairly easily. The var. *recognitum* is very obscure, however, the leaves appearing to be intermediate between the two extremes. Fernald and Schubert acknowledged that "the three varieties may merge" and

that "nondescript individuals can be found." In fact, two of these taxa, var. *acutifolium* and var. *recognitum*, may even grow closely associated within the same habitat, judging from Fernald's annotations on herbarium material. Obviously, therefore, *H. denticulatum* is in need of careful and intensive study, especially in the field. It is not unlikely that some differentiation may have occurred, rendering the plants of the Coastal Plain slightly distinct from those of the Piedmont and the mountains. However, I think that the variation picture within this species is not so easily understood as Fernald and Schubert's analysis would suggest.

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